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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Steve J. Shields et al.

Group Art Unit 2834

VEHICLE AC GENERATOR
THROUGH-BOLT

Examiner K. Addison

Serial No. 09/977,047

Filed: October 12, 2001

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Assistant Commissioner for Patents
Washington, D.C. 20231

REQUEST FOR RECONSIDERATION

Sir:

In response to the Office Action mailed April 10, 2002, applicant respectfully requests reconsideration of the rejection of claims 1-8 as filed.

In the Office Action claims 1 and 2 were rejected under 35 USC 112, second paragraph, on the ground that the phrase "whereby the through-bolt is subject to bending stress since it does not operate on a solid stack up" is vague and indefinite. The meaning of the term "solid stack up" was also questioned. In a phone call to the examiner, this phrase was explained as is outlined below.

The term solid stack up is explained and used consistently in the application as referring to a solid stack of the ears against one or more components which would lie between the ears and through which the bolt would extend to solidly clamp the components together. The absence of such a stack because of the cantilevered nature of the ears on the generator of the present invention is the cause of bending of the ears, which in turn creates bending of the bolt. The term solid stack up is explained in the application first on page 1, lines 22-25 where it is noted

"Also the through-bolts bend due to the cantilevered nature of the mounting wherein ears in which the through-bolts are mounted extend beyond the stator and the ears are spaced with no stack up between the ears, see FIG. 1."

The absence of a solid stack up as one of the sources of the bending fatigue problem is again noted in the application at page 1, line 26 to page 2, line 3; page 3, lines 3-4; and page 4, lines 24-28 as well as in claims 1 and 5.

In view of the foregoing it is believed that the term "solid stack up" is adequately defined in the specification so as to have a clear and definite meaning in the claims. Accordingly, withdrawal of the rejection of claims 1 and 2 under 35 USC 112 is requested.

Claims 1, 3-5 and 7-8 were rejected under 35 USC 103(a) as unpatentable over U.S. 5,210,453 Nelson in view of 4,229,875 Crispell. Claims 2 and 6 were also rejected on the same basis and further in view of 5,433,570 Koppel. Reconsideration is requested.

Nelson discloses an alternator construction wherein the through-bolts which hold sections of the alternator housing together extend through ears which are cantilevered outward of the housing and are spaced apart so that there is no solid stack up between the ears. Thus the ears are subject to bending and possible bending of the through-bolts in the same manner as taught in the present application. However, Nelson does not recognize this as a problem nor suggest it. Instead, he concentrates on avoiding noise caused by vibration of the bolt heads along the face of the ears they engage, and he solves that problem by counter-sinking the holes from the faces of the respective ears so

that the bolt heads lie within the countersunk portions and are prevented from vibrating. Thus Nelson does not recognize or suggest either the problem or the solution which have been identified by applicants in the present application.

The Office Action indicates that Crispell in FIG. 2 discloses a bolt having a head 6, a shank 8, a threaded portion 20 and a necked down portion 13. However, this conclusion is inaccurate because FIG. 2 of Crispell does not depict a finished bolt but the process by which a bolt is stretched during the time that threads are being formed on the necked down portion 13. Thereafter, the enlarged threaded portion 20 is cut off, leaving the resulting bolt with threads located only in the reduced diameter portion 13 as shown in FIG. 3. Reference is made to column 3, lines 1-7 for an explanation of this process and in particular to the terminal sentence reading: "The threaded region 20 is then cut off or removed and the remaining portion of the bolt is finished and pointed to length, as shown in FIG. 3."

Koppel discloses a screw used in a very different application in which there is a problem with bending but no indication of a problem with vibration as is the case with the AC generator of the present invention. Koppel's screw has two threaded portions, one adjacent the head and one near the end of the shank. His screw is used in a manner such that the two threaded portions engage different portions of a structural member wherein some relative motion is possible so that bending of the screw may occur because of misalignment or temperature induced expansion and contraction.

Koppel makes the shank more flexible by removing material from the unthreaded portion to avoid failure of the screw at the threaded portion. However, Koppel also teaches that the grooves in the bolt must be produced by material removal instead of by rolling because the shank of the screw will not be sufficiently elastic and absorb the bending load if the grooves are rolled. Koppel also teaches that the cross-section of the shank at the base of the groove must have at least the core cross-section or diameter of the threaded region in order to have sufficient strength for the screw to be tightened in the manner intended. (See column 1, line 56 to column 2, line 26.)

The Office Action assumes that it would have been obvious to one of ordinary skill in the art to modify the generator of Nelson by utilizing the bolt of either Crispell or Koppel. Applicant traverses this conclusion for a number of reasons as explained below.

First of all, there is nothing in the art cited which teaches or suggests that the problem experienced by applicant was caused by bending stress of the generator housing connecting bolts combined with the vibrational loads placed on the bolts by the generator and its mounting in a vehicle. The recognition of the bending stress problem came only after extensive modeling of the generator construction and testing of components to determine the cause of the bolt fatigue failures experienced in some of the generators.

Although the bending problem is illustrated in applicants' FIG. 1 by a greatly exaggerated distortion of the ears and the bolts, it should be recognized that, in the actual generator housings, the amount of bending distortion is very small and not obvious upon viewing of the assembled unit. Thus, it was necessary to conduct extensive modeling of the structure and analysis of its motion to determine the cause of the problem before consideration of a resulting solution could be given. Further it was not known that the application of bolts conventionally stressed only in tension, as bolts are preferably used, would be applicable to the solution of the problem discovered by applicants of bolts exposed to vibration while under a bending load. Also, if the combination is obvious, why has no one suggested the use of such bolts in this type of generator before now?

Further, as to the cited art, it is apparent that Crispell has no bearing on the present invention as it does not teach the solution of the problem. In similar fashion, Koppel applies only to an extremely different situation and problem which would not have been the basis for one skilled in the art to have solved the problem presented to applicants inventors and thus cannot be considered obvious to one skilled in the art to combine with Nelson.

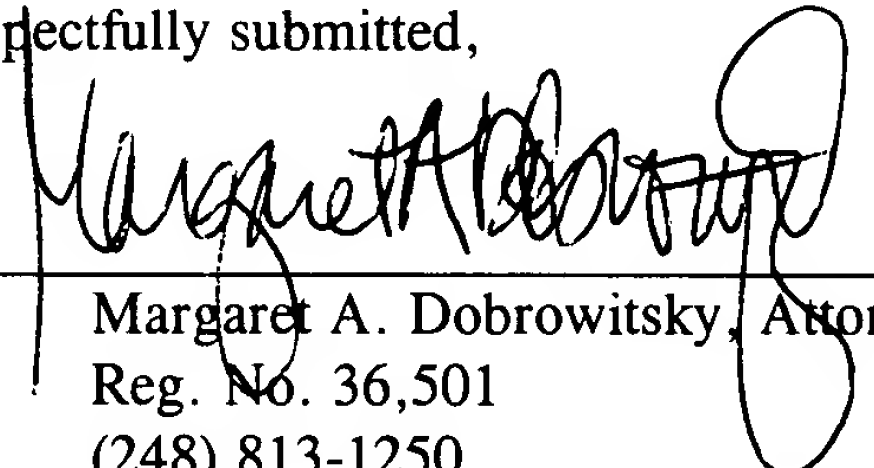
Additionally it is noted that all of applicants' claims 1-8 are limited by "said shank portion being necked down adjacent said threaded portion to a diameter sufficiently less than a minor diameter of threads in said threaded portion such that the resistance of said through-bolt to fatigue failure is increased." Also, claims 4 and 8 require that the necked down feature is rolled into the through-bolt. These aspects of the invention are opposite to what is taught by Koppel which says that the production of grooves in the bolt shank must be accomplished by removal of material and not by rolling or the bolt will not accomplish its purpose. He also teaches that the grooves should have a diameter not less than the base diameter of the threads while applicants bolts are necked down to a smaller diameter than the root of the threads.

For all of the foregoing reasons, it is submitted that the rejections of claims 1-8 under 35 USC 103 are not supported by the prior art and should be withdrawn. An action to that effect is, accordingly, requested.

This Request For Reconsideration is believed to be fully responsive to the issues raised in the Office Action and to place this case in condition for allowance. Favorable action is requested.

Respectfully submitted,

By


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